CLAIMS

What is claimed is:

1. A circular directional array antenna comprising:

a driven omnidirectional traveling-wave antenna element coupled to a transceiver via a feed network; and

a plurality of surface-waveguide elements symmetrically positioned about and concentrically spaced from the driven omnidirectional traveling-wave antenna element, each surface-waveguide element configured to receive a control signal configured to alter a surface-waveguide transmission characteristic.

2. The circular directional array antenna of claim 1, further comprising:

a ground plane having a plurality of vias, wherein the driven element and the surface-waveguide elements are adjacent to the ground plane and connected to the transceiver and control signal, respectively, through the corresponding feed network and the vias.

3. The circular directional array antenna of claim 2, wherein the ground plane comprises a reactive surface.

4. The circular directional array antenna of claim 2, wherein the ground plane comprises a conductive surface.

5. The circular directional array antenna of claim 2, wherein the ground plane is finite and symmetrical about the driven element.

6. The circular directional array antenna of claim 2, wherein the driven omnidirectional traveling-wave antenna element generates an omnidirectional surface wave substantially parallel to the ground plane.

7. The circular directional array antenna of claim 2, wherein the ground plane comprises a reactive surface which modifies the shape of the radiation pattern in elevation with respect to the ground plane.

8. The circular directional array antenna of claim 1, wherein the driven omnidirectional traveling-wave antenna element comprises a mode-0 slow-wave antenna.

9. The circular directional array antenna of claim 1, wherein the driven omnidirectional traveling-wave antenna element comprises a mode-0 spiral-mode microstrip antenna.

10. The circular directional array antenna of claim 1, further comprising:

a switching circuit having a plurality of inputs and a corresponding plurality of outputs, the outputs independently responsive to a beam steering means coupled to the inputs, wherein a respective output is coupled to each of the surface-waveguide elements.

11. The circular directional antenna of claim 10, wherein the waveguide characteristic of each of the surface-waveguide elements is selectively controlled to pass or reflect a traveling wave.

12. The circular directional array antenna of claim 10, comprising:

a conducting enclosure configured to surround the switching circuit to suppress radio frequency leakage and electromagnetic coupling between the driven omnidirectional traveling-wave antenna element and the surface-waveguide elements through the control circuit.

13. The circular directional array antenna of claim 12, wherein the conducting enclosure comprises mode suppressors arranged around the switching circuit with a distance between adjacent mode suppressors being less than $\lambda/4$, where λ is the wavelength of the highest operating frequency.

14. A method for operating a broadband/multiband beam-steered circular array antenna, comprising:

locating a driven broadband/multiband traveling wave antenna element that generates an omnidirectional electromagnetic radiation pattern on a ground plane;

concentrically arranging a plurality of broadband/multiband surface-waveguide elements around the driven omnidirectional traveling-wave antenna; and

applying control signals configured to steer the electromagnetic radiation by selectively altering waveguide characteristics of respective surface-waveguide elements that receive the control signals.